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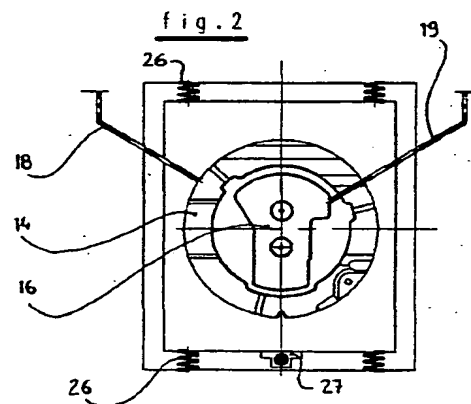
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(54) Method for manufacturing counterweights for washing machines and counterweights obtained thereby

(57) Method for manufacturing counterweights for washing machines, comprising the moulding of bodies of plastic material (15, 17) which are then filled, when they are still in the mould (13), with inert material mixed with water. Such a filling material is compacted by letting the counterweights undergo a vibratory compaction phase as they are still in the mould or after they have been removed therefrom.

*Holes  
in the body  
filled*



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## Description

The present invention refers to a method for manufacturing counterweights for clothes washing machines, in particular of the household type, as well as the counterweights that are obtained with such a method.

Clothes washing machines are generally known to be usually provided with counterweights which serve as means for ballasting the same machines so as to reduce the dynamic stresses that are imparted during the rotation of the drum in the washing and, above all, the high-speed spin-extraction phases of the clothes washing process. Such counterweights are generally secured to the exterior of the wash tub and are made in a variety of manners. Traditionally, they are formed by concrete blocks that are given appropriate shapes according to the position in which they are to be mounted, for instance on the front wall or the rear wall of the tub, or even on top of the same tub. Fastening means adapted to co-operate with corresponding attachment means provided on the wall of the tub are inserted in such concrete blocks so as to protrude from said blocks accordingly.

Counterweights are also known, which are formed by two annular shells of plastic material adapted to enclose blocks of concrete or any other suitable material having a high specific gravity (US patent no. 5,211,038), as well as counterweights which are formed by moulded flange of plastic material in the shape of a continuous hollow ring with a U-shaped cross-section, said flange being further provided with radial ribs adapted to accommodate, and keep in position, concrete masses (GB-A-2 044 298). Counterweights are finally known which are obtained by blow moulding hollow bodies of plastic material that are then filled with concrete or any other material having similar properties.

However, all above cited solutions, further to requiring rather long, complicated and expensive manufacturing processes, do not allow for a requirement to be complied with, which is becoming increasingly advantageous and, above all, is quite often even provided for by definite law regulations, i.e. the possibility for the various materials used in the construction of a machine to be conveniently separated from each other in view of enabling them to be recovered for recycling or reuse.

It is therefore a main purpose of the present invention to provide a method for manufacturing counterweights for clothes washing machines which is actually capable of enabling counterweights to be obtained which can be entirely recovered at the end of the life cycle of the machines in which they are used, owing to their convenient and easy separability from the other component parts and materials used in the construction of the same machines.

It is a further, important purpose of the present invention is to provide a manufacturing method that enables differently shaped finished counterweights to be manufactured simultaneously, thereby bringing about considerable time saving effects in the manufac-

turing and processing cycle and, as a result, corresponding saving effects in the overall costs of each single counterweight manufactured according to the proposed method. Furthermore, the method according to the present invention calls for replacing concrete with another filling material, such as preferably mill scale, which is capable of bringing about a further environmental advantage, since it represents a hardly disposable waste material.

All these aims are reached in a manufacturing method that calls for the hollow bodies to be filled, while they are still inside their mould, with the inert material mixed with water, wherein said material is then compacted by letting said hollow bodies to a vibratory compaction phase, as this is recited in the appended claims.

Advantages and characteristics of the present invention will however be more readily understood from the description which is given below by way of non-limiting example with reference to the accompanying drawings, in which:

- Figure 1 is a schematical representation of the manufacturing method according to the present invention;
- Figure 2 is a schematic, enlarged view of the mould used in the method illustrated in Figure 1;
- Figure 3 is a schematical, cross-sectional view of the mould illustrated in Figure 2;
- Figure 4 is a schematical view of an annular counterweight obtained with the method of Figure 1 and the mould of Figures 2 and 3; and
- Figure 5 is a schematical view of an upper counterweight obtained with the method of Figure 1 and the mould of Figures 2 and 3.

With reference to Figure 1, the method for manufacturing counterweights for clothes washing machines according to the present invention is described with reference to the schematical representation of a plant for carrying out such a method. The counterweights are formed by a hollow body of plastic material which is filled with compacted inert material. The hollow body is manufactured by a blow moulding process, which is a largely known and used method in the art of plastic processing.

The plastic material used for such a moulding operation is preferably polypropylene, which is taken from an appropriately provided reservoir 10 and is supplied through a conduit 11 to a blow moulding machine 12. According to a feature of the present invention, the blow moulding machine 12 comprises a twin-cavity mould 13 (Figures 2 and 3), wherein a first cavity 14 is used for moulding a hollow body 15 (Figure 4), used for manufacturing an annular counterweight, while a second cavity 16 is used for moulding a hollow body 17 (Figure 5).

used for manufacturing an upper counterweight. As shown in Figure 2 as an elevational view and in Figure 3 as a cross-sectional view, the first mould cavity 14 is arranged so as to surround the second mould cavity 16, in such a manner as to enable the hollow bodies 15 and 17, which are both needed usually in the construction of a clothes washing machine, to be moulded simultaneously in said two cavities, respectively. The counterweight that is made out of the hollow body 15 will be applied on to the front wall of the wash tub of the clothes washing machine, while the counterweight that is made out of the hollow body 17 will be applied on to the upper portion of the wash tub of the clothes washing machine.

The manufacturing method according to the present invention is mainly characterized in that the process in which the hollow bodies 15 and 17 are moulded is immediately followed by the therewith associated process in which said hollow bodies are filled with high specific-gravity inert material so as to complete the whole counterweight manufacturing process. In fact, the cavities 14 and 16 of the mould 13 are connected, through respective conduits 18 and 19 (Figure 1), with an inert-material mixing and feeding apparatus. Such an apparatus comprises two filling hoppers 21, 22 for the inert material and an additive, respectively, which are contained in respective reservoirs 23 and 24.

According to a further feature of the present invention, the inert material used in the process is formed by mill scale, such as oxidized sheet-metal particles. Such mill scale, which forms owing to atmospheric oxidation in the rolling phase at the mill and, when finally removed mechanically from the rolled products, generally becomes a hardly disposable industrial waste material, can in this way be recovered and recycled with a considerable advantage in terms of environment safeguard.

For this material to be able to be used as a filling material in such counterweights, it shall be charged and mixed with a liquid additive, preferably water. It is therefore provided for the mill scale coming from the reservoir 23, and passing through the hopper 21, and the water flowing from the reservoir 23, and passing through the hopper 22, to be mixed by means of a vertical screw 25, to the lower end portion of which the hoppers 21 and 22 are connected (Figure 1).

The method according to the present invention is further characterized in that the compaction of the inert material used to fill the counterweights is carried out by vibrations. In a preferred manner, the mould 13 is sustained by springs 26 and is connected to a motor vibrator 27. This solution enables the time needed to manufacture the counterweights to be drastically reduced, since the entire manufacturing cycle (ie. moulding the hollow bodies, filling the same hollow bodies with inert material, compaction of the filling material) is completed without any handling of the mould being actually required.

It will of course be appreciated that a number of modifications can be made to the above described method and a number of variants can be derived there-

from without departing from the scope of the present invention. For example, the vibratory compaction of the counterweight filling material can also be carried out after the counterweights have been removed from the mould. In such a case the processing time would be extended, but the construction of the moulding machine would be made simpler.

Furthermore, other inert materials derived from wastes and scraps from machining and other mechanical processes can be used in this connection, provided that they can be compacted while however remaining conveniently separable from the hollow container in which they are filled. In fact, a further, important advantage of the present invention is obtained when the clothes washing machine provided with the above described counterweights according to the present invention is eventually discarded and scrapped at the end of its life cycle. For reasons of environmental safeguard, the materials of which the various parts of the machine are made must in fact be capable of being separated according to their different nature. The counterweights according to the present invention fully comply with such a requirement, since the wrapper of plastic material can be easily cut and separated from the mass of inert material with which it will have not amalgamated.

#### Claims

1. Method for manufacturing counterweights for clothes washing machines, in particular of the type for use in the home, including the moulding of hollow bodies of plastic material and the filling thereof with high specific-gravity inert material, characterized in that the hollow bodies of plastic material (15, 17) are filled, while still inside the mould (13), with inert material that is mixed with water, the so filled hollow plastic bodies being then submitted to a vibratory action to compact the filling material inside the same hollow bodies.
2. Method according to claim 1, characterized in that the hollow plastic bodies (15, 17) filled with inert material mixed with water are submitted to vibratory compaction while still enclosed in their respective mould cavities (14, 16).
3. Method according to claim 1, characterized in that the hollow plastic bodies (15, 17) filled with inert material mixed with water are submitted to vibratory compaction after they have been removed from their respective mould cavities (14, 16).
4. Method according to any preceding claim for manufacturing annular counterweights and upper counterweights, characterized in that for moulding the hollow bodies of plastic material (15, 17) a single mould (13) with two cavities (14, 16) is used, the mould cavity (16) for an upper counterweight being

arranged inside the cavity (14) provided for an annular counterweight.

5. Method according to any preceding claim, characterized in that a blow moulding process is used for moulding the hollow bodies of plastic material (15, 17). 5
6. Method according to any preceding claim, characterized in that the filling inert material that is used to fill the hollow bodies of plastic material (15, 17) is formed of mill scale. 10
7. Counterweights for clothes washing machines, particularly of the type for home use, characterized in that they are manufactured with the method according to any of the preceding claims. 15

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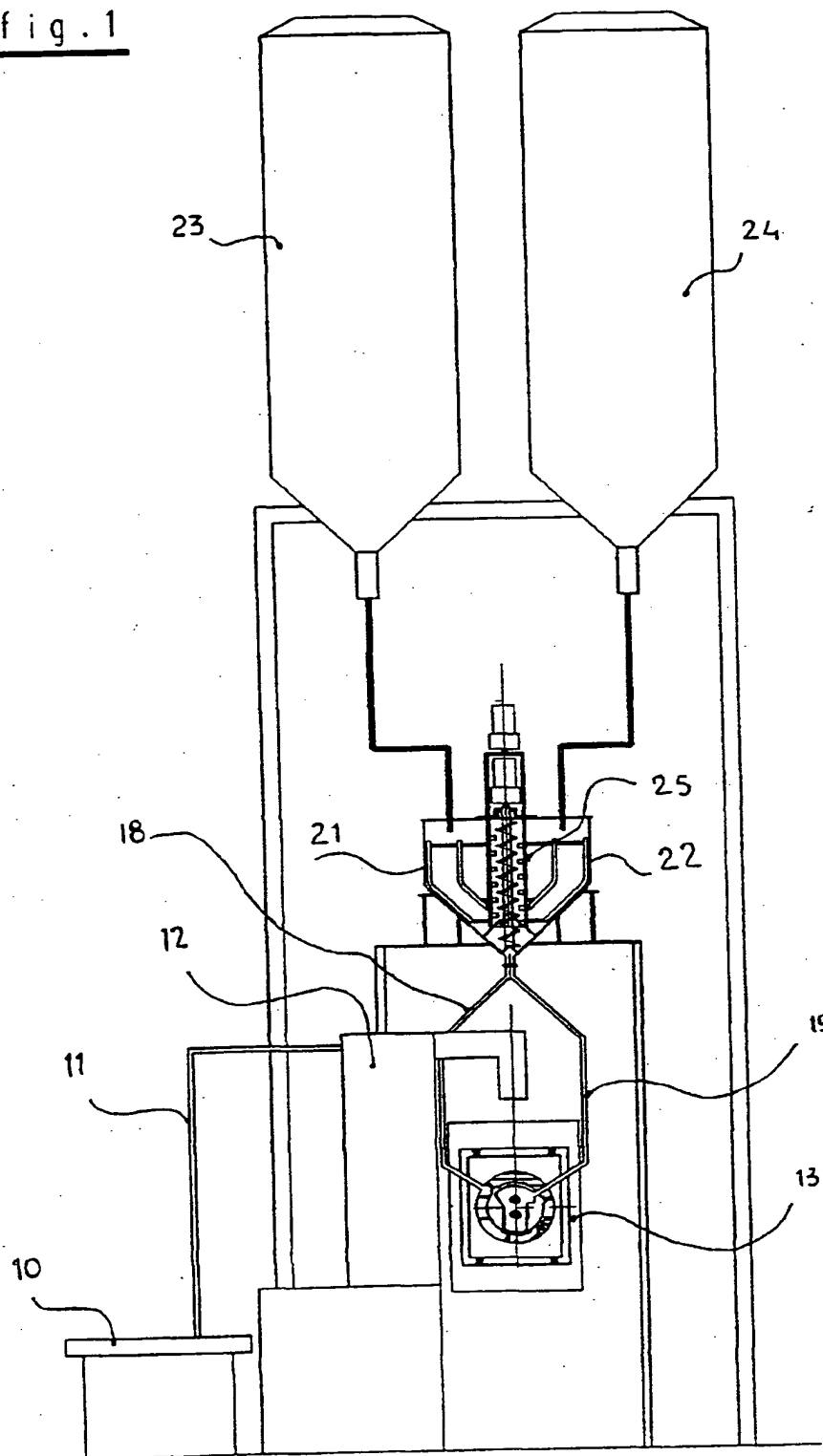
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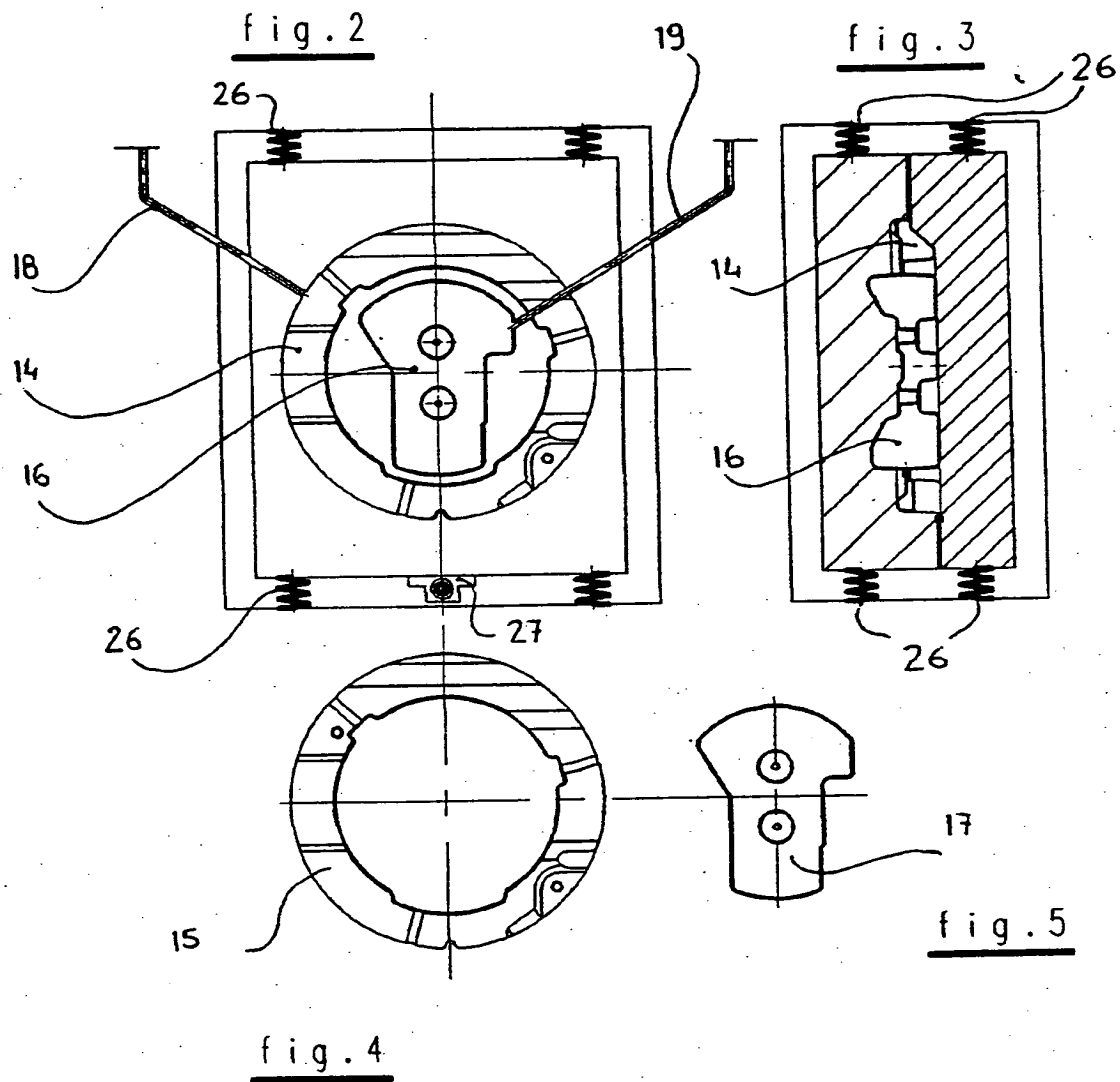
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fig. 1





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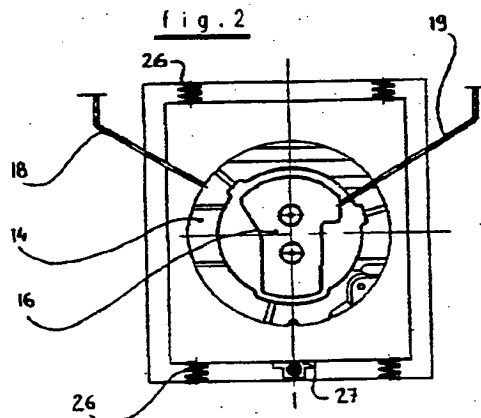
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# EUROPEAN SEARCH REPORT

Application Number

EP 97 10 5328

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	EP 0 515 874 A (ZANUSSI ELETTRODOMESTICI) 2 December 1992 * abstract; figures * * column 5, line 53 - column 7, line 23 * ---	1,7	D06F37/26 D06F37/20
A	EP 0 623 436 A (PESCATORI STEFANO) 9 November 1994 * abstract; figures * -----	1,7	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			D06F
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 11 August 1998	Examiner Helpö, T
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